

TRACE-P C_1 - C_5 Alkyl Nitrates: Production, Evolution and Distribution

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Planned TRACE-P alkyl nitrate papers:

1. **Distribution:** “Latitudinal and vertical distributions of C_1 - C_5 alkyl nitrates in the troposphere over the western Pacific Ocean during TRACE-P”
2. **Production and evolution (kinetics):** “Production and evolution of C_2 - C_5 alkyl nitrates in tropospheric air influenced by Asian outflow”



Alkyl Nitrate Measurements during TRACE-P

	Parent RH	Daughter RONO ₂	
C ₁	methane	methyl nitrate	(MeONO ₂)
C ₂	ethane	ethyl nitrate	(EtONO ₂)
C ₃	propane	1-propyl nitrate	(1-PrONO ₂)
	"	2-propyl nitrate	(2-PrONO ₂)
C ₄	<i>n</i> -butane	2-butyl nitrate	(2-BuONO ₂)
C ₅	<i>n</i> -pentane	2-pentyl nitrate	(2-PeONO ₂)
	"	3-pentyl nitrate	(3-PeONO ₂)

Detection:	0.02 pptv
Precision:	2%
Accuracy:	10-20%

Alkyl Nitrates

- ❖ **low reactivity:** serve as reservoir for long-range transport of NO_x
- ❖ explain **lack of closure** in NO_y budget
 - Continents: $\text{RONO}_2 < 10\% \text{NO}_y$
[e.g. *Ridley et al.*, 1990; *Flocke et al.*, 1991]
 - MBL PTA: RONO_2 20-80% NO_y
[*Talbot et al.*, 2000]
- ❖ estimate **photochemical age** using $[\text{RONO}_2] / [\text{parent RH}]$
- ❖ unique opportunity to compare **field** measurements with newly published values from **laboratory** studies



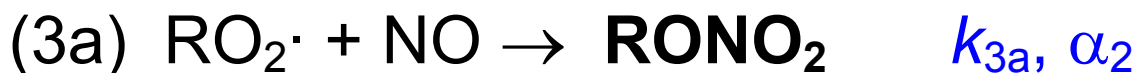
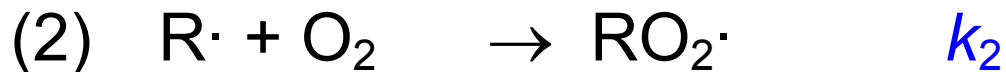
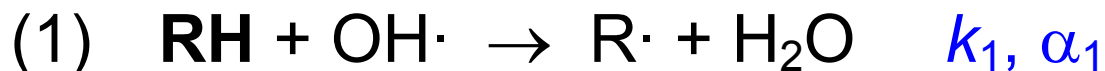
Alkyl Nitrate Production

Two pathways:

1. Marine emissions

- importance ↓ for ↑ carbon number
- varies with latitude

2. Photochemical production



k = reaction rate constant

α = branching ratio